Continuous Emissions Monitor for Total Mercury Based Upon Surface Acoustic Wave Technology

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Abstract

Mercury (Hg) is a ubiquitous environmental pollutant found in a variety of chemical and physical forms throughout the biosphere. Waste incinerators (i.e. hazardous waste incinerators, municipal waste incinerators, medical waste incinerators, and sewage sludge incinerators) are among the most prolific anthropogenic emitters of mercury into the atmosphere. In order to better understand mercury emission sources, transport throughout the biosphere, and environmental and societal impacts, continuous emissions monitors (CEMs) for mercury concentration measurements at each source are imperative. While commercially available CEMs based upon spectroscopic technologies have been used for several years in Europe, many doubt that use of this instrumentation by the myriad small- and medium-sized emitters will ever be economically feasible. New technology must be developed which is less expensive, simpler to maintain and operate, and more robust.

Microwave acoustic devices offer a promising new approach to detection of environmental pollutants. By incorporating a thin film which selectively chemically sorbs a target measurand (e.g. mercury), electrical and mechanical changes in the thin film are manifested as alterations in the resonant frequency of the acoustic wave device. Thus, by coating a surface acoustic wave (SAW) delay line with a gold film a highly sensitive mercury vapor sensor can be realized.

It is the overall objective of this work to demonstrate the feasibility of a SAW mercury vapor sensor and to incorporate the technology into a CEM for use in a hazardous waste incinerator. Results to date demonstrate that both elemental mercury and mercuric chloride can be detected at single μg/dscm levels in the presence of other combustion byproducts. This poster presentation will discuss the results to date, remaining work, and future potential for this technology.